

小児班の検診においても、時間を競う運動能力評価法が、なかなか理解されなかったという。学童の運動能力を測るための方法も、多くの場合、動作の俊敏性という時間の要素を加味した評価法が用いられる。

隣村にゆくために車をチャータしたが、そのドライバーが時間通りに来たためしはなかった。毎回、2-3時間は遅れてくるのだ。

ヴィルカバンバのような所では、速さを競うという方法自体が、問題かもしれない。生活のうえで「競う」という必要がないのだ。ある動作の時間を測定するということが自体が意味をなさない可能性もある。

産業革命以来、「より速く、より多くのことを効率よく成し遂げる」ということが、西欧近代合理主義の価値観の一つではあったが、迅速大量生産という概念自体が近年見直されてきている。「時間がかかっても、より確実に」という概念も重要な価値である。

ひょっとすると、ヴィルカバンバの老人たちは、私たちの「健康度」評価法では、評価しきれなかった“のんびり元気”であった可能性もある。

## フンザとの対比

ヴィルカバンバとフンザは、世界の伝説的長寿郷としてよく知られている。同じように、長寿郷とよばれるこの二つ地域の高齢者の「健康度」が、なぜこれほどちがうのだろうか。

フンザは、6,000メートル級の山々と氷河がおりなす断がい絶壁にかこまれた標高2,500メートルのオアシスである。オアシスといっても、牧草地を含めた生活圏内をつなぐ農道は、時には険しい谷に降り、がけを高まいて続いている。人々は日々の生活のために、これらを日に何度も通ることを余儀なくされているだろう。足腰の動きは、必然的に俊敏さを要求される。

またフンザは、秋から冬にかけては厳しい雪の季節で、農作業や遊牧は季節のめぐりに追われている。田舎では万年一日のごとく、年単位の生活はのんびりしているものの、四季のめぐりには敏感であろう。当然、「急ぐ」という感覚にはなじんでいるものと思われる。フンザの老人たちが、時間を測定する「健康度」の指標において、抜群の成績を示した背景には、このような事情がある

のかもしれない。

一方、ヴィルカバンバは、標高1,500メートルの高原平野といってもよい。老人たちの働く場所は、この平原圏内が中心と考えられている。生活圏は極めて狭い。より遠出をするときは、バスを利用するだろう。ゆっくりと確実に歩ける限り、さほどの俊敏性は生活上要求されない。

また、ヴィルカバンバは1年中20度前後の温和な気候帯にある。農作業についても、季節や時間に追われるということが少ない。

また、キリスト教の陰に深く底流するインカの太陽信仰という文化のありかたが、闘争的なイスラム文化とちがった生活形態、価値観をはぐくんできた可能性もある。

たとえ、同じ健康で長寿な老人であっても、ひとたび環境が異なれば、その「健康度」のありかたもおのずから異なっている可能性を痛感した。

以上の結果は、ヒマラヤ学誌5号の特集に掲載されている。

## おわりに

高知医科大学「フィールド医学」研究会の学生ならびに教官は、毎年のように、夏期休暇その他を利用して、海外の高齢者を訪ねる調査旅行にかけた。その対象地域は、1994年：中国雲南省の麗江、1995年：中国チベット自治区古措、1998年：モンゴルのウランバートル周辺地域、1999年：ニューギニアなどである。これら、調査旅行で得られた医学的知見の一部は、ヒマラヤ学誌6号から7号にわたって報告してきた。高知県香北町の毎年のフィールド調査や海外の医学調査旅行に参加した高知医科大学「フィールド医学」研究会の学生は100名を超えていると思われる。彼ら、彼女らの多くは、すでに中堅の臨床医として全国で活躍している。学生時代の6年間を通じて経験した国の内外における「フィールド医学」の経験は、その後の彼らの臨床医としての歩みに何らかの影響をもたらしているであろう。

2000年1月1日付けで、私は、京都大学東南アジア研究センターへ異動となった。今まで、医学部のなかでフィールド活動を行っていたのが、京都ではフィールドワークによる地域研究を本務とする研究所で、医学の領域を切り拓く立場に変わった。協力講座として医学研究科のなかに

「フィールド医学」講座が認められ、大学院生を育成できる制度も整った。当初、高知医大の学生文化系サークルのひとつに過ぎなかった「フィールド医学」研究会が、京大医学研究科の小さいながらもひとつの講座として認知されたことは一定程度の進歩であろう。現在、「高所プロジェクト」に積極的にかかわろうとしている仲間たち、すなわち奥宮清人（地球研：助教授）、和田泰三（京大老年科助手を経て現在、ロンドン大学熱帯医学修士課程へ留学中）、石根昌幸（京大フィールド医学講座院生）、藤沢道子（国立長寿科学センター医員）の各氏は、すべて高知医大「フィールド医学」研究会の仲間であり、全員がAACKに加入している。そして、彼らは、学生時代から、「ヒマラヤ学誌」に投稿を続けてきた。いわば、「ヒマラヤ学誌」は、彼ら医学系フィールドワーカーにとっては、かけがえのない発表の場であり、論文作成をきたえられる教育媒体としても機能してきた。

ここ数年、私と、すでに研究者として成長し始めた彼ら医学系のフィールドワーカーたちは、京大東南アジア研究所の他分野のフィールドワーカーたちとともに、アジアの諸地域で広範な高齢者フィールド医学的調査を展開している<sup>23)-37)</sup>。当初の研究対象が熱帯アジアであり、「高所」にはやや遠ざかったため、「ヒマラヤ学誌」ともなじみにくかったが、次年度以降、奥宮清人をリーダーとする総合地球環境学研究所の「高所プロジェクト」が軌道にのれば、私たちの研究領域は、再び、高所を包摂することが可能となる。装いあらたな「ヒマラヤ学誌」が、次年度以降、本地球研プロジェクトに参加する多くの若手研究者の発表の場となることが期待される。

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# 人口転換

松林公蔵

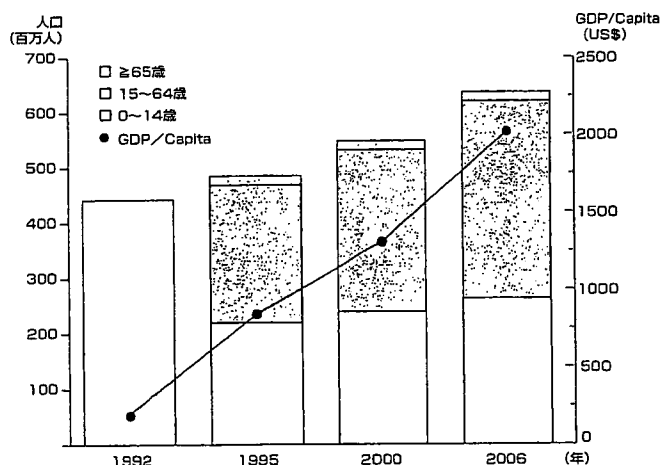
ラオスでも「緑の革命」が徐々に浸透し、ゆるやかな経済成長と人口転換がおこっている。平均寿命はここ十年で約五歳延伸している。人口転換と表裏する栄養転換により、従来、問題であった感染症にくわえ生活習慣病も増加しはじめ、高齢者の健康像はあらたな段階に入ろうとしている。



## ラオスの社会経済的変遷

第二次大戦後の一九四六年、王国政府はラオス全域の自治政府として承認され、一九四七年にはラオス憲法が公布された。しかし以後も、国王派と反国王勢力の争いやラオス北部の食料自給地域と南部の輸出推進地域の経済格差をめぐる角逐から、東西冷戦構造にまきこまれ、ラオス動乱、第二次インドシナ戦争、ラオス革命などの係争が続いた。「桜井 二〇〇三」。一九八六年のラオス人民革命党大会では、自由主義経済原理を大幅に取り入れ、西側諸国やタイ、中国との関係改善を目指した「チンタナカーン・マイ」(新思考)と「ラポップ・マイ」(新制度)の導入を決定して市場経済をめざした。この方向転換は、過去四半世紀にわたる党支配の歴史において、画期的な意味をもっている。「上東 一九九二」。これを機に、ラオスは経済の立て直しと国交正常化を図る穏健な社会主義へと変化してゆくのだが、市場経済化といってもラオスの独自のいわば国家管理の市場経済である。図1に、一九九二年から二〇〇六年までの、ラオスにおける年齢別人口動態の変遷と

図1 ラオスにおける人口動態と国民1人あたりのGDPの変化(1992~2006年)



一人当たりの国内総生産(GDP)の推移を示した。二〇〇六年度現在のラオスの人口増加率は二・三九%(タイ・〇・六八%、カンボジア・一・七八%、ベトナム・一・〇二%)と高く、経済成長率も

七・三%(タイ・四・五%、カンボジア・十三・四%、ベトナム・八・五%)であり、東南アジア周辺国と較べても遜色ない。

## ラオスにおける人口転換

人類の集団の人口構成は、社会が未成熟な間は多産多死であるが、やがて社会の成熟とともに、多産少死、やがて少産少死へと推移する。この現象を、人口転換とよぶ。図2に、ラオスにおける人口一〇〇〇人あたりの出生率と死亡率の一九九二年から二〇〇六年までの推移を示した。ラオスでも、この十五年間で出生率は減少傾向にあり、また死亡率も同様である。図3に、ラオスの一九九二~二〇〇六年における平均寿命の伸びを示した。平均寿命は、一九九二年に男・四十九歳、女・五十二歳であったのが、この十五年間に男で四・五歳、女で五・六歳の伸びを示している。ラオスの六十五歳以上の高齢者の全人口に占める割合は、まだ三%余であるが、高齢者の実数は確実に増加してきており、今後、社会の高齢化がますます進行することは間違いない。

図2 ラオスにおける出生率ならびに死亡率の推移 (1992~2006年)

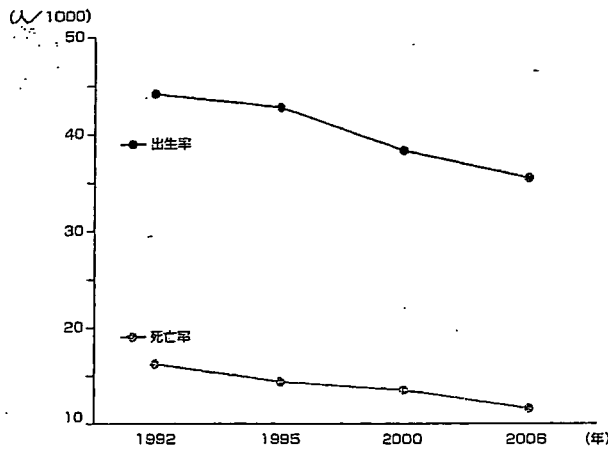
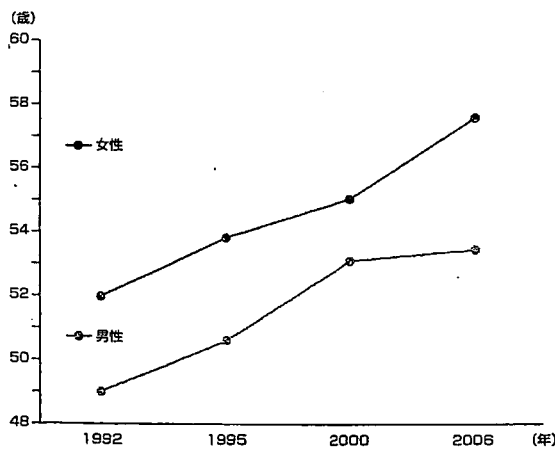
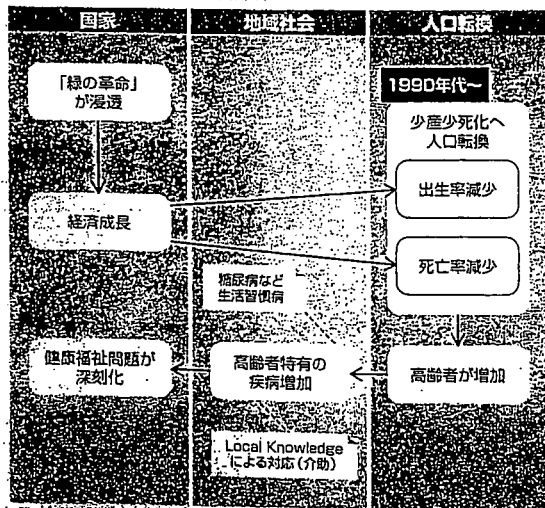


図3 ラオスにおける平均寿命の推移 (1992~2006年)



ラオスにおける人口転換と高齢者



### ラオス高齢者の健康実態

二〇〇四年度と二〇〇五年度において、サバナケット周辺のラハナムならびにバキンソン地区において、六十歳以上の地域在住高齢者の健診をおこなった。延べ受診者総数は六一一名で、そのうち九十歳以上が十五名、百寿者二名が含まれていた。寝たきりで重症の要介護者はきわめて少なかったが、日常生活に一部介助を要する高齢者が三割程度認められた。高齢者の疾病としては、貧血が高度に認められた(世界保健機構の基準であるヘモグロビン値が男:十三g/dl、女:十二g/dl未満を適用すると、九八%が貧血となる)。これは、栄養状態やマラリア

アなどの慢性感染症の影響が推察されるが、世界の統一基準の適用ということ自体を再考する必要があるかもしれない。高血圧は、東南アジアの周辺地域と比較して多くはないが、特筆すべきは糖尿病あるいは耐糖能異常の高齢者が多いことである(写真1)。これについては、別項で、奥宮が詳細に論じている。



写真1 糖尿病を有する百寿者

### おわりに

先進諸国は豊かな社会を実現してから高齢化が進

んだのに対して、一般にアジアの諸地域では社会経済が豊かになる前に高齢化をむかえざるを得ない。ラオスの今後の保健福祉問題は、「感染症」、「高齢化」、「乏しい財源」という「triple burden」をかかえている。ラオスでは、高齢者の増加というグローバルパレシヨンの趨勢を受け入れながらも、その地域固有の土着の知(Local Knowledge)を活かしつつ改編し、能動的に対処することを迫られている。地域研究では、このあたりの消息を明らかにする必要があるだろう。

文献

桜井由躬雄 二〇〇三 『東南アジアの歴史』放送大学教育振興会。

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# **Comprehensive Geriatric Assessment and Team Intervention**

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# Comprehensive Geriatric Assessment and Team Intervention

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## Abstract

As people age, they tend to suffer from disease and various other age-related problems. Because the elderly generally have a variety of problems related to physical functioning as well as psychiatric, psychological, or socioeconomic issues, the conventional medical care model that focuses only on disease itself often fails to provide an adequate solution. A specific procedure oriented to the elderly is comprehensive geriatric assessment (CGA). CGA evaluates the extent of functional impairment of the elderly from the medical, social, psychiatric, psychological, and physical aspects, and allows multidisciplinary intervention by a team of health professionals that can include physicians, nurses, physiotherapists, pharmacists, dietitians, caregivers, and social workers. The reported advantages of CGA include a decrease in the number of admissions, reduced length of hospital stay, a decrease in the number of institutionalized elderly, improvement in activities of daily living (ADL), and early detection of dementia and efforts to halt its progress. However, inappropriate use of CGA and inappropriate selection of subjects can lead to failure in achieving a satisfactory result. In Japan, the introduction of government-sponsored long-term care insurance furthered the spread of the CGA concept. A deeper understanding of the need for multidisciplinary intervention based on the cooperation of the medical and nursing sectors is expected, with improved medical and nursing care of the elderly being the anticipated outcome.

**Key words** Elderly, Comprehensive geriatric assessment (CGA), Multidisciplinary approach, Activities of daily living (ADL), Long-term care insurance

## Introduction

In 1964, Williamson et al., who examined elderly residents in Scotland, found that their family physicians did not have sufficient understanding of the patients' various problems, including impaired functioning in daily living, and noted for the first time the importance of comprehensive geriatric assessment (CGA).<sup>1</sup>

In Japan, a government-sponsored long-term care insurance system launched in 2000 directed the attention of general clinicians to the impaired functioning of the elderly. A person who receives benefits from long-term care insurance is required to obtain certification of their necessity from a physician. In the process of obtaining certifi-

cation, the concept of CGA is incorporated in the core assessment of basic activities of daily living (BADL), instrumental activities of daily living (IADL), cognitive function, and abnormal behavior. In addition, it is also required that a description of functioning in daily living be provided in the attending physician's statement. Because of these changes, greater knowledge of functioning in daily living has become essential for the attending physician, and thus physicians' attention to this matter has increased. Further, from the fact that a number of recent reports have presented the results of evaluations of the intervention of nursing care or rehabilitation training in terms of CGA, it is expected that attention to CGA will increase in the future.

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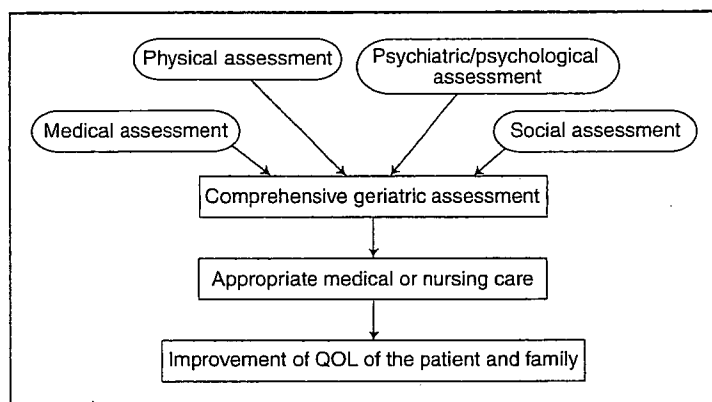
## What is CGA?

CGA is a geriatric procedure in which a comprehensive evaluation including the medical, social, psychiatric/psychological, and physical aspects of an elderly individual with a disease or disorder is undertaken to determine the extent of the individual's impaired functioning in daily living (Fig. 1).<sup>2</sup>

Impaired functioning consists mainly of movement problems, urinary or fecal incontinence,

dementia, unstable movement/falling, and communicative disorder (visual and hearing acuity, speech function, etc.).<sup>3</sup> Such impairments can result from a variety of causes, and the chronic process of the condition interferes with the independence of the elderly individual. Because of this, elderly individuals with impaired functioning tend gradually to become in need of long-term care.

Behind the growing need for CGA is the marked increase in the number of elderly patients with impaired functioning as well as the recogni-



(Excerpted from Nishinaga M. Japanese Journal of Geriatrics. 2000;37:859-865)

Fig. 1 Comprehensive geriatric assessment (CGA)

Table 1 Items and procedures of comprehensive geriatric assessment

- (1) Basic activities of daily living (BADL)
  - Eating, bathing, dressing, mobility, walking to toilet, urinary control, etc.
  - Barthel index
  - Katz index
- (2) Instrumental activities of daily living (IADL)
  - Telephoning, shopping, preparing meals, housekeeping, laundry, going out to nearby places, transportation, medication management, money management, etc.
  - Lawton
  - ADL-20, Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence
- (3) Cognitive functions
  - MMSE (mini-mental state examination)
  - HDS-R (Hasegawa's dementia scale-R)
- (4) Mood
  - GDS (geriatric depression scale), GDS15
- (5) Communication: Visual and hearing acuity, swallowing
- (6) Social environment: Home environment, caregiver, care and support system

(Adapted from The Japan Geriatrics Society ed. Geriatrics textbook (revised edition). Medical View Co., Ltd., Tokyo, 2002;153.)



tion that the conventional acute-disease model, which has been used for infections or other diseases, is no longer suitable in this situation. Therefore, a method of functional evaluation was required that would provide relevant information on the actual functioning of the elderly patient to the geriatric care professional, while being applicable to complex symptoms and patient needs related to disease or impaired functioning. In addition, a methodology for providing appropriate care to the patient according to his or her individual situation was also required.<sup>3</sup>

**Fundamentals of CGA**

CGA is a method used to assess impaired functioning that takes into account the following functions:

physical, psychiatric/psychological, social, and medical. The elements of CGA include: 1) basic activities of daily living (BADL), 2) instrumental activities of daily living (IADL), 3) cognitive function, 4) mood, 5) communication (visual or hearing disorders), and 6) social environment (family environment, caregiver, care and support system, etc.) (Table 1).

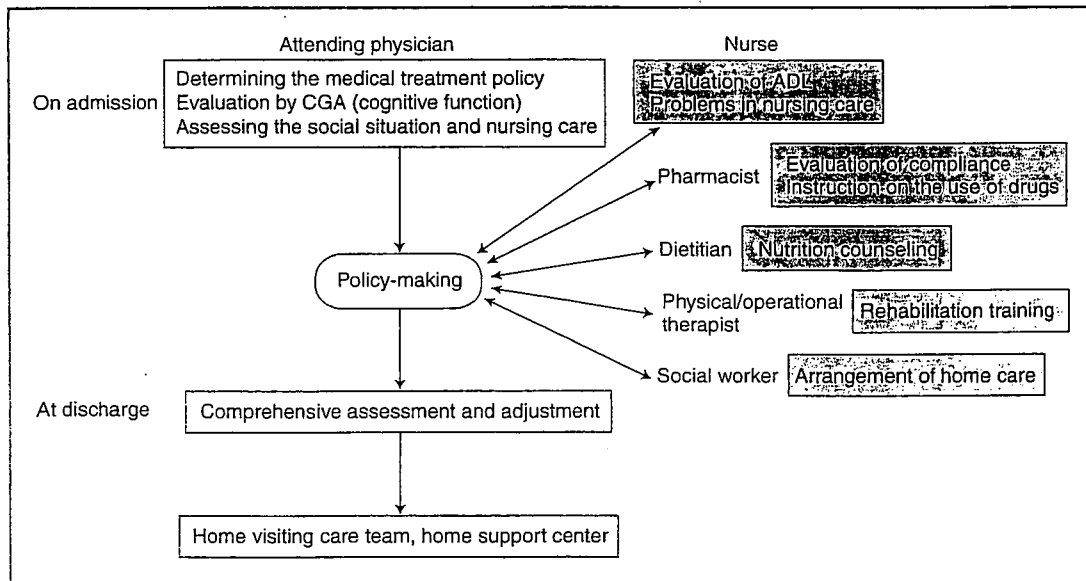
**Forms of CGA and Their Usefulness**

It has been reported that CGA is effectively associated with a decreased number of admissions, reduced length of hospital stay, decreased institutionalization, improved QOL, decreased medication, improvement of ADL, and decreased mortality.<sup>4,5</sup> CGA is divided into several forms

**Table 2 Forms of comprehensive geriatric assessment (CGA)**

- (1) Geriatric evaluation and management unit (GEMU) (ward)
- (2) Inpatient geriatric consultation service (IGCS)
- (3) Outpatient assessment service (OAS)
- (4) Hospital-home assessment services (HHAS)
- (5) Home assessment service (HAS)

(Excerpted from Stuck AE, et al. Lancet. 1993;342:1032-1036)



(Excerpted from Nishinaga M. Japanese Journal of Geriatrics. 2000;37:859-865)

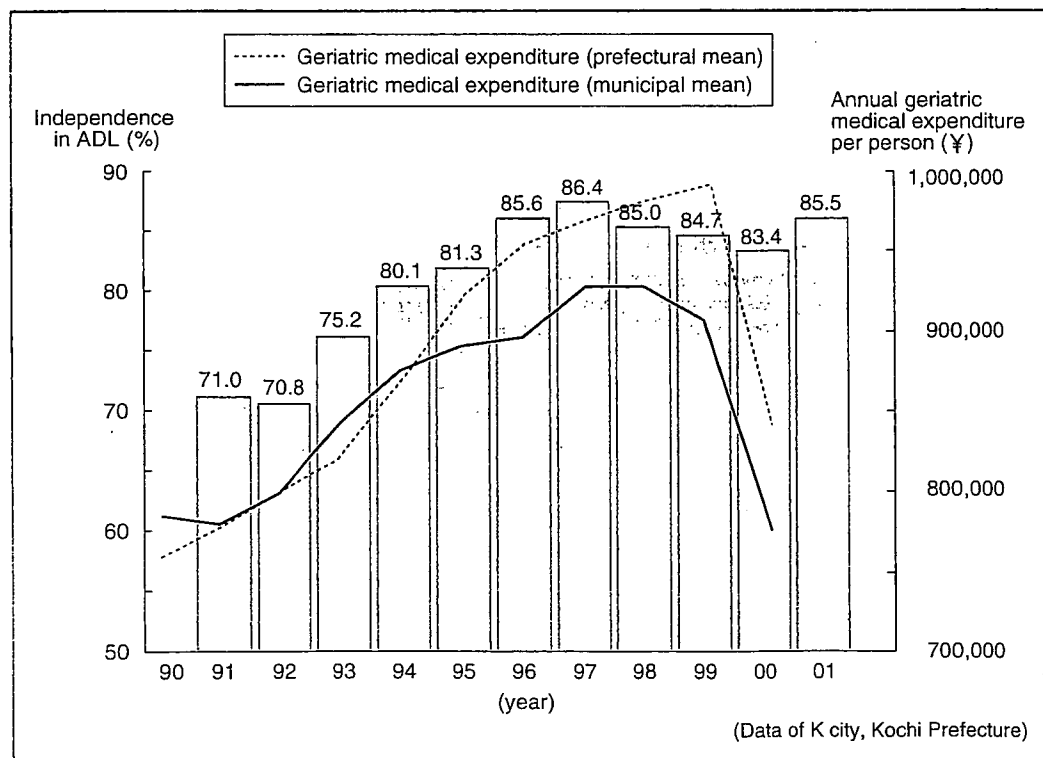
**Fig. 2 Flow chart of the multidisciplinary approach**

according to its usage (Table 2).<sup>5</sup>

CGA employed for elderly patients with complex problems who were admitted to evaluation and management in special units designed for such patients have been reported to confer various benefits, such as improved functioning including ADL scores, decreased institutionalization, and decreased mortality.<sup>1-5</sup>

Repeated admissions represent a problem common to elderly patients with heart failure. Of 104 patients admitted to a hospital because of heart failure (mean age 79.2 years), 32% were admitted again within 6 months,<sup>6</sup> and 36% of the reasons for readmission were factors other than the disease itself, such as decreased compliance. In this connection, multidisciplinary intervention by a team consisting of the attending physician, physical/occupational therapist, medical social worker, nurse, dietitian, and pharmacist was carried out in a CGA and management unit, in order to allow elderly patients with heart failure to continue living at home after discharge

(Fig. 2).<sup>2</sup> Among patients who experienced two or more admissions within 2 years, 66 patients (mean age 80 years) who were admitted to the CGA and management unit were compared with 112 patients (mean age 81 years) who were admitted to general wards. The percentage of patients who experienced another admission within 30 days after discharge was 17% for general ward patients, whereas it was 1.5% for CGA unit patients. The corresponding percentages for readmission within 100 days after discharge were 41% in general ward patients and 21% in CGA unit patients. Thus, both readmission rates were lower in CGA unit patients.<sup>6</sup> In addition, when NYHA functional classification, ADL score, number of admissions and hospital days with heart failure, and total medical cost before intervention were compared with those after intervention in 29 patients who were followed for more than a year after discharge from the CGA unit, all these parameters were found to have improved after intervention.<sup>7</sup>



(Excerpted from Department of Geriatrics, Kochi Medical School Hospital. 2002 Report of the Kohokucho Healthy Long Life Plan)

Fig. 3 Annual changes in degree of independence and geriatric medical expenditure over 10 years in elderly residents in a city in Kochi Prefecture

The use of CGA for inpatient consultation or outpatient assessment represents a low-cost strategy, but few reports have documented its usefulness, probably because of the lack of sufficient control over home care after discharge, resulting in inadequate implementation of the recommendation and interventions indicated by CGA, because of the failure to choose subjects who could benefit most, or because of the lack of long-term follow-up. Since most elderly patients require home care, it is considered that the usefulness of CGA depends on the coupling of assessment during hospital stay and care after discharge.<sup>1</sup>

CGA of local elderly residents has progressed in the UK, Denmark, and other countries, and is mainly aimed at preventing the frail elderly from falling into a state that would require nursing care. In recent years, the usefulness of this type of CGA has been reported from the USA, Italy, Germany, and other countries. In Japan, Matsubayashi et al. carried out CGA in local elderly residents of a city in Kochi Prefecture, and provided intervention based on the results of assessment. As a result, they obtained an increase in the percentage of elderly individuals independent in ADL and a lowering of the increase rate in mean annual medical care expenditure per elderly individual, despite the further aging of the population<sup>8</sup> (Fig. 3).

Stuck et al.,<sup>5</sup> who carried out a meta-analysis of 28 reports on CGA using controls, reported that improvement in physical function was obtained only when CGA was used in specialized CGA units, and the preventive effect on institutionalization was associated only with CGA used for local elderly residents. In addition, a significant prolongation of home care was achieved only by CGA in specialized CGA units and by CGA used for discharge from the hospital to home.

All healthcare professions dealing with the elderly are required to consider the treatment and care of these patients, based on a broad vision that includes not only the patients them-

selves but also their families. A uniform, rigid intervention that provides a patient with a predesignated form of care is not adequate for the complex situations of individual patients. Although it is apparent that CGA is a useful method of assessment, it is necessary in implementing the recommendations drawn from the results of assessment to be aware of the change in the system, giving close attention to the following: selecting appropriate subjects; coordinating assessment, care planning, and implementation; and conducting regular follow-up evaluations.

In many hospitals where CGA has been introduced, various healthcare professions including physicians, nurses, physiotherapists, pharmacists, caregivers, and medical social workers share information in a common language (i.e., via a standardized assessment tool), and participate as independent professionals in preparing the treatment or care plan and the individual medical or nursing care plan from hospital to home, thereby improving the quality of care plans. In addition, more than a few CGA instructors attach importance to the effect of this approach in leading to an increase in the motivation of each healthcare professional as an independent specialist.

## Conclusion

Although the concept of CGA is spreading to local communities following the advent of government-sponsored long-term care insurance, when long-term care insurance is to be provided, continuity from medical care to nursing care is mainly based on the attending physician's statement. Therefore, support for such continuity can be somewhat precarious in the case of frail elderly patients who are repeatedly hospitalized. Although changes will be made to the medical care system and a rapid increase in the population of the frail elderly is likely in the future,<sup>9</sup> the spread of CGA as a powerful tool of medical institutions directed toward local residents is certainly desirable.

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are multiple levels of evidence and to implement programs based on the highest level possible. Communities and organizations with limited resources may need to design programs based on lower levels of evidence, but the most effective programs will be those that incorporate Level A interventions, and we should endeavor to develop programs that use such interventions whenever possible.

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#### PREVALENCE OF HYPERTENSION AND ITS AWARENESS, TREATMENT, AND SATISFACTORY CONTROL THROUGH TREATMENT IN ELDERLY JAPANESE

*To the Editor:* Hypertension (HT) is one of the major cardiovascular risk factors in elderly people and is associated with lifestyle and socioeconomic status. The prevalence of HT in people aged 70 and older has been reported to be 71.2% for men and 80.3% for women in countries with

established market economies.<sup>1</sup> The increase of HT over the last decade and its unsatisfactory control in people aged 70 and older in the United States were shown.<sup>2</sup> In this study, we showed the prevalence of HT, awareness, treatment, and satisfactory control in community-dwelling people aged 70 and older living in rural towns in Japan.

The study population consisted of 1,256 people aged 70 and older (449 men, 807 women, mean age 79.8), living in Miyagawa City in Mie Prefecture (59 men, 124 women, mean age 79.7), Tosa City (97 men, 227 women, mean age 80.7) and Kahoku City (143 men, 223 women, mean age 79.2) in Kochi Prefecture, Urausu City in Hokkaido Prefecture (55 men, 85 women, mean age 79.8) and Yogo City in Shiga Prefecture (95 men, 148 women, mean age 79.4). There was no difference in the mean age between subjects with and without HT. In total, 1,256 subjects were examined from 1999 to 2004. Blood pressure was measured twice in a seated position after a 5-minute rest using an auto-sphygmomanometer (HEM 757, Omron, Japan). HT was defined as an average systolic blood pressure (SBP) of 140 mmHg or greater and an average diastolic blood pressure (DBP) of 90 mmHg or greater or current use of anti-hypertensive medication. The awareness group was defined as subjects who knew that they had HT, and the treatment group was defined as subjects currently taking antihypertensive medication daily. Satisfactory control in the treatment group was defined as subjects having controlled SBP and DBP of less than 140 and less than 90 mmHg, respectively. Statistical analysis was performed using a chi-square test and an unpaired Student *t*-test, with *P*-values less than .05 considered statistically significant.

Table 1 shows the prevalence of HT, awareness, treatment, and satisfactory control through treatment in Japanese community-dwelling elderly people. The prevalence of HT was 74.2% (*n* = 932) overall; it was significantly higher in women (76.6%) than in men (69.9%) (*P* = .01), similar to the prevalence in the United States.<sup>2</sup> The prevalence of HT was 72.5% in subjects aged 70 to 79 and 76.3% in those aged ≥ 80 and older, although there was no significant difference between the two groups. The rate of awareness was 67.9%, with no significant difference between the sexes or age groups. The rate of treatment was 60.9% overall, with that of men (56.4%) being significantly lower than that of women (63.3%) (*P* = .04). The rate of satisfactory control through treatment was 31.7% overall, with that in subjects aged 80 and older (27.2%) being significantly lower than that in those aged 70 to 79 (35.7%) (*P* = .03).

The prevalence of HT in elderly Japanese was almost the same as that in the United States<sup>2</sup> (i.e., 72% in U.S. subjects aged 70–79; 77% in those aged ≥ 80). Thus, the rates of awareness, treatment, and satisfactory control through treatment in elderly Japanese seem to be lower than those in the United States. In particular, the rates of awareness (Japan, 69%; United States, 74%), of treatment in those aged 70 to 79 (Japan, 61%; United States, 67%), and of satisfactory control through treatment in those aged 80 and older (Japan, 27%; United States, 31%) appear to be lower in Japan than in the United States.

This study found that, in Japan, the prevalence of HT in people aged 70 and older is approximately 70%, which is similar to that of other developed countries.<sup>1,2</sup> The rate of

Table 1. Prevalence of Hypertension and Rate of Awareness, Treatment, and Satisfactory Control with Treatment in Japanese Aged 70 and Older from 1999 to 2004

Characteristic	All Subjects n	Those with Hypertension			
		Prevalence of Hypertension	Awareness	Treatment	Satisfactory Control with Treatment
Total	1,256	932 (74.2)	633 (67.9)	568 (60.9)	180 (31.7)
Male	449	314 (69.9)	208 (66.2)	177 (56.4)	57 (32.2)
Female	807	618 (76.6)*	425 (68.8)	391 (63.3)†	123 (31.5)
Age					
70-79	683	495 (72.5)	340 (68.7)	300 (60.6)	107 (35.7)
≥ 80	573	437 (76.3)	293 (67.0)	268 (61.3)	73 (27.2)‡

\* $P < .05$ , prevalence of hypertension between men and women ( $\chi^2$  test).

† $P < .05$ , prevalence of treatment between males and females ( $\chi^2$  test).

‡ $P < .05$ , prevalence of satisfactory control with treatment between those aged 70-79 and those aged 80 and older ( $\chi^2$  test).

treatment for HT in men was found to be lower than that in women in Japan, with rates of awareness and treatment being lower than those in the United States. Furthermore, the rate of satisfactory control in Japanese people aged 70 and older currently being treated for HT was also surprisingly lower than that of the United States. Although the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure<sup>3</sup> reported that HT was an apparent independent risk factor for cardiovascular events, it was emphasized that an SBP of 140 mmHg or higher was a much more important cardiovascular disease risk factor than DBP in people aged 50 and older. Nevertheless, controversy still remains as to whether blood pressure should be kept under 140/90 for older elderly populations.<sup>4</sup>

In conclusion, geriatricians in developed countries should be knowledgeable about the actual states of awareness, treatment, and satisfactory control of HT in elderly people. Lower rates of satisfactory control of HT in elderly people in Japan might indicate that community doctors do not adequately appreciate the need to control HT strictly in older subjects and in particular in patients aged years and older, as studies in the United States have suggested. Further study and discussion is required as to the appropriate control and prevention of HT in older populations.

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ORIGINAL ARTICLE: EPIDEMIOLOGY,  
CLINICAL PRACTICE AND HEALTH

# Effects of long-term exercise class on prevention of falls in community-dwelling elderly: Kahoku longitudinal aging study

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**Background:** We intended to compare the effect on preventing falls between the subjects participating and not participating in exercise classes over 8 years of follow up in all the community-dwelling elderly in Kahoku Town, Kochi Prefecture, Japan.

**Methods:** We compared falling state both in 1993 and 2001 between 119 participants (male : female ratio, 51:68; mean age, 72.5 years) in exercise class during the 8-year period from 1993–2001, and 878 non-participants (M : F ratio, 243:635; mean age, 73.4 years). We assessed the long-term effects of participating in exercise classes on preventing falls via multivariate, longitudinal analysis.

**Results:** Only participation in both the 1993–1995 period and 1996–2001 one was a significantly independent contributing factor for prevention of falls even after the adjustment for age, sex, activities of daily living, depression scale and presence/absence of oral drugs (odds ratio, 0.20;  $P = 0.007$ ). Although it failed to reach significance in this study, recent and continuing exercise was supposed to be effective for prevention of falls.

**Conclusion:** Unlike a short program, long-continuing exercise is effective in preventing falls of community-dwelling elderly for a long time after the adjustment of age, activities of daily living, depression and other confounding variables.

**Keywords:** community-dwelling elderly, exercise class, fall.

## Introduction

Since 1991, we have carried out several geriatric interventions to sustain activities of daily living (ADL) of the elderly living in Kahoku Town, Kochi Prefecture, Japan with a purpose of not only preventing diseases but also sustaining comprehensive functions of the community-dwelling elderly (Kahoku Longitudinal Aging Study,

KLAS). As a result, we revealed favorable effects of geriatric interventions on the improvement or sustaining of functional independence in the community-dwelling elderly population.<sup>1–7</sup> As one of the programs of KLAS, the exercise class in Kahoku was introduced in 1993.<sup>2</sup> This study demonstrated the acceptability and effectiveness of exercise on neurobehavioral functions, even in older people more than 75 years of age.<sup>2</sup>

The susceptibility to fall related to aging may include various factors. The timed “up and go” test, which was found to be improved by physical exercise in the community-dwelling older elderly in KLAS,<sup>2</sup> was the independent predictor of falls both in our cross-sectional and in longitudinal studies. The timed up and

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go (TUG) test was recognized as a useful and easy-to-administer predictor of falls in older people.<sup>4</sup> There have been many reports on exercise programs to prevent falls in older people,<sup>8-18</sup> however, few have studied the effect of exercise sessions on a whole community population for a long time. In this article, we intended to compare the effect on preventing falls between the subjects participating and not participating in exercise classes in over 8 years of follow up in all community-dwelling elderly people in Kahoku.

## Patients and methods

### Study population

The study population consisted of 119 participants (male : female ratio, 51:68; mean age, 72.5 years) in exercise classes during the 8-year period from 1993-2001, and 878 non-participants (M : F ratio, 243:635; mean age, 73.4 years).

### Exercise programs

#### Floor exercise<sup>2</sup>

Floor exercise was performed once a week for approximately 1 h each time. The following programs were adopted under a professional instructor: (i) aerobic exercise; (ii) anaerobic exercise; (iii) calisthenics; (iv) neuromuscular coordinating exercise; and (v) voluntary exercise at home.

#### Underwater exercise

Underwater exercise was introduced from 1994. Underwater exercise was performed once a week for approximately 1 h each time in a warm-water pool. Underwater walking, swimming, calisthenics and group gymnastics were adopted as programs.

#### Questionnaire survey (1993 and 2001)<sup>4</sup>

All the subjects, including both participants and non-participants, were followed and requested to provide answers in both 1993 and 2001.

#### Fall

All the subjects were requested to choose from the four items of: (i) "I scarcely fall"; (ii) "I sometimes fall"; (iii) "I often fall and it is problematic in daily life"; and (iv) "I have experienced a fall-related bone fracture or serious injury."

#### Activities of daily living<sup>1</sup>

We assessed seven ADL items (walking, ascending/descending the stairs, taking meals, clothing, toileting, bathing, grooming) noting the help required, with four

grades from complete independence to full aid scoring with 3-0 points. The subjects who got full marks for all seven items (21 points) were regarded as subjects independent in ADL, and the subjects with less than 21 points were all regarded as subjects dependent in ADL.

#### Additional items of assessment

The following additional items were assessed: depression scale (15-item geriatric depression scale, GDS),<sup>19,20</sup> presence/absence of history of stroke or cardiac diseases; taking oral drugs and/or antihypertensive drugs; urinary incontinence; and cognitive impairment (classification of dementia-related dependence according to the Ministry of Health, Labor and Welfare in Japan). We got informed consent every year from all the participating subjects who answered the questionnaire.

## Results

Among the eligible 1774 residents aged 65 years or older being at home in Kahoku Town in 1993 (total population, 5966; people aged 65 years or older, 1916), 1601 residents (90.2%) answered the questionnaire. Of those, 358 died by 2001 (8 years later) and 120 were admitted to hospital or nursing facilities, and 68 did not answer the questionnaire in 2001. The final valid answer givers (in both 1993 and 2001) accounted for 997 (including 67 admitted to hospital or nursing facilities). Of the 997 elderly subjects, 119 had a history of participating in the exercise classes in the 8-year period 1993-2001, and 878 ones had never participated in the classes. Table 1 shows a comparison of base-line characteristics between these two groups. Although the rate of male was significantly higher and the subjects having a history of stroke were significantly lower in the participating group than in the non-participating one, there were no significant differences in other characteristics between the two groups (falling state, independence in ADL, depressive state [GDS,  $\geq 10$ ], taking drugs and/or antihypertensive ones, urinary incontinence and cognitive impairments [ $\geq$ grade IIa in classification of dementia-related dependence according to the Ministry of Health, Labor and Welfare in Japan]).

Table 2 shows comparison of falling state, ADL and depressive state in 1993 and 2001 between participants and non-participants in the exercise classes during the 8-year period. In 1993, there were no significant differences between participants and non-participants in either item; however, in 2001, the incidence of falls were significantly lower and the rate of ADL independence was significantly higher in the participating group than in the non-participating one.

Table 3 shows factors associated with worsening of fall incidence during the 8-year period in monovariate



**Table 1** Comparison of base-line characteristics between participants and non-participants in the 1993 exercise class

	Participants	Non-participants	<i>P</i>
No. of subjects	119	878	
Age	72.5 years	73.4 years	ns
Male	42.9%	27.7%	0.0012
Fall incidence			
"I scarcely fall." <i>n</i> (%)	105 (88.2)	760 (86.6)	ns
"I sometimes fall."	14 (11.8)	106 (12.1)	
"I often fall and it is problematic in daily life."	0	1 (0.1)	
"I have experienced a fall-related bone fracture or serious injury."	0	11 (1.3)	
ADL			
Persons independent in ADL (21 points) <i>n</i> (%)	117 (98.3)	832 (94.8)	ns
Persons dependent in ADL ( $\leq$ 20 points)	2 (3.5)	46 (6.3)	
Depressive state			
Mean GDS (points)	4.6 $\pm$ 3.3	5.1 $\pm$ 3.6	ns
GDS of $\geq$ 10, <i>n</i> (%)	10 (8.4)	124 (14.2)	ns
GDS of <10	109 (91.6)	750 (85.8)	
History of stroke			
Yes	1 (0.9)	41 (4.9)	0.05
No	114 (99.1)	794 (95.1)	
Taking drugs (including antihypertensive drugs)			
Yes	48 (40.3)	350 (40.6)	ns
No	71 (59.7)	512 (59.4)	
Taking antihypertensive drugs			
Yes	33 (27.7)	243 (28.2)	ns
No	86 (72.3)	619 (71.8)	
Urinary incontinence			
Yes	0 (0)	15 (1.7)	ns
No	119 (100)	844 (98.3)	
Cognitive impairment			
$\geq$ Grade IIa in classification of dementia-related dependency	6 (5.3)	83 (10.6)	ns
$\leq$ Grade I	107 (94.7)	703 (89.4)	

ADL, activities of daily living; GDS, 15-item geriatric depression scale.

analysis in two models according to the mode of participation in exercise. We analyzed the odds ratio of participants versus non-participants on the subjects whose fall incidence increased as the dependent variable. In the 8-year period 1993–2001, 119 subjects attended exercise class (model 1). In those 119 subjects, 19 attended exercise class only during the 3-year period 1993–1995, 29 subjects attended exercise class only during the 5-year period 1996–2001, and 71 subjects attended exercise class in both the 1993–1995 and 1996–2001 periods (model 2). As shown in model 2, worsening of fall incidence was strongly suppressed in the participants in both the 1993–1995 and 1996–2001 periods (odds ratio, 0.20;  $P = 0.008$ ), however, each group who participated only 1993–1995 or only 1996–2001 failed to reach a significant odds ratio.

Table 4 shows odds ratios in monivariate analysis for worsening of fall incidence during the 8-year period of other confounding variables. Age, female sex, dependence in ADL, depressive state (GDS,  $\geq$ 10) and taking drugs were found to be associated with worsening of fall incidence, but history of stroke, taking antihypertensive drugs, urinary incontinence and cognitive impairment were not associated with falls.

Table 5 shows effects of participation in the exercise class on preventing of fall incidence during the 8-year period in all subjects and non-fallers in 1993 in multivariate analysis. As shown in Table 5, only participation in both the 1993–1995 and 1996–2001 periods was a significant independent variable even after the adjustment for age, sex, ADL, depression scale and presence/absence of oral drugs (odds ratio, 0.20;  $P = 0.007$ ). Even

**Table 2** Comparison of falling state, ADL and depressive state between participants and non-participants in 2001

	Participants		Non-participants	
	1993	2001	1993	2001
Fall incidence				
"I scarcely fall." <i>n</i> (%)	105 (88.2)	104 (87.4)	760 (86.6)	669 (76.2)*
"I sometimes fall."	14 (11.8)	12 (10.1)	106 (12.1)	158 (18.0)
"I often fall and it is problematic in daily life."	0	1 (0.8)	1 (0.1)	16 (1.8)
"I have experienced a fall-related bone fracture or serious injury."	0	2 (1.7)	11 (1.3)	35 (4.0)
ADL				
Persons independent in ADL (21 points) <i>n</i> (%)	117 (98.3)	98 (82.4)	831 (94.8)	603 (70.0)**
Persons dependent in ADL ( $\leq 20$ points)	2 (3.5)	21 (17.6)	46 (6.3)	259 (30.0)
Depressive state				
Mean GDS (points)	4.6 $\pm$ 3.3	5.6 $\pm$ 3.8	5.1 $\pm$ 3.6	6.2 $\pm$ 3.6
GDS of $\geq 10$ , <i>n</i> (%)	10 (8.4)	19 (17.1)	124 (14.2)	163 (21.1)
GDS of $< 10$	109 (91.6)	92 (82.9)	750 (85.8)	609 (78.9)

\* $P < 0.05$ , \*\* $P < 0.01$ , participants vs non-participants in 2001 ( $\chi^2$  test).

**Table 3** Factors associated with worsening of fall incidence during the 8-year period (monovariate analysis): two models according to the mode of participation in exercise

	Odds ratio	<i>P</i>
Model 1		
In the 8-year period 1993–2000,		
Participated in exercise class ( <i>n</i> = 119)	0.42	0.01
No participation in exercise class at all ( <i>n</i> = 878)	1.0	
Model 2		
Participated in exercise class only in the 3-year period 1993–1995 ( <i>n</i> = 19)	1.24	ns
Participated in both the 3-year period 1993–1995 and the period 1996–2001 ( <i>n</i> = 71)	0.20	0.008
Participated only in the 5-year period 1996–2001 ( <i>n</i> = 29)	0.54	ns
No participation in exercise class at all ( <i>n</i> = 878)	1.0	

when the same analysis was performed only in the subjects who were non-fallers in 1993 (*n* = 865 subjects), the result was almost the same, as shown in the right part of Table 5.

From 1993–2000, participation for exercise class was effective for prevention of successive death (odds ratio, 0.43;  $P = 0.03$ ) after the adjustment for confounding variables.

## Discussion

We revealed the effect of participation in the exercise classes on the prevention of falls in community-dwelling elderly people. Worsening of fall incidence was suppressed to a significantly more favorable extent in the 71 subjects who participated in both 1993–1995 and 1996–2001 periods after the adjustment of the confounding factors such as age, sex, ADL, depression scale and presence/absence of oral drugs (odds ratio, 0.20;

$P = 0.007$ ) compared with non-participants, 19 participants during only 1993–1995, or 29 participants during only 1996–2001. Although subjects who participated in exercise classes during only the earlier or later period did not show a significant effect of exercise on preventing falls, the subjects who participated only during 1996–2001 were supposed to fail to reach a significance because of the smallness of subjects number.

In the previous reports, many kinds of exercises such as tai chi, balance training, muscle strengthening training and agility training have been reported to be effective for the prevention of falling.<sup>8–18</sup> In this study, all kinds of exercise were involved, including underwater exercise. Although there have been many reports on exercise programs to prevent falls in older people, few have studied the effect of exercise sessions on the whole community population for a long time. We compared the effect of preventing falls between the participating and non-participating subjects in the exercise class in

**Table 4** Other factors associated with worsening of fall incidence during the 8-year period (monivariate analysis)

Age	1.1	<0.0001
Sex		
Female	1.8	0.002
Male	1.0	
ADL		
Independence	0.33	0.0006
Dependence	1.0	
Depression scale		
GDS of $\geq 10$ , <i>n</i> (%)	1.83	0.006
GDS of $< 10$	1.0	
History of stroke		
Yes	1.44	ns
No	1.0	
Taking drugs (including antihypertensive drugs)		
Yes	1.78	0.001
No	1.0	
Taking antihypertensive drugs		
Yes	1.29	ns
No	1.0	
Urinary incontinence		
Yes	0.78	ns
No	1.0	
Cognitive impairment		
$\geq$ Grade IIa in classification of dementia-related dependence	1.4	ns
$\leq$ Grade I	1.0	

the entire community-dwelling elderly throughout the town during the long period of 8 years. This study is not a controlled study. But the controlled study had been already carried out in this exercise class in the participants during the 6 months in 1993, revealing that exercise was effective in neurobehavioral function especially in the TUG test.<sup>2</sup> In another study of ours, the TUG test was the independent predictor of falls both in our cross-sectional and longitudinal studies.<sup>4</sup> After finishing the controlled study in the first year of 1993, the exercise class was opened for any community-dwelling people and many subjects participated in the class each year freely. Although some study limitations, such as non-controlled study and that some subjects participated irregularly, may exist, persistent open sessions for exercise were proved to be effective in the whole community for a long time in this study. That is why this community-based study is very valuable notwithstanding it being a non-controlled study.

### Conclusion

In conclusion, unlike a short program, long-continuing exercise is effective in preventing falls in elderly people for a long time after the adjustment of age, ADL, depression and other confounding variables. Community-dwelling elderly people who have risks of falling are recommended to join supervised group exercise sessions to maintain or improve geriatric comprehensive functions.

**Table 5** Effect of participation in the exercise class (two models) on worsening of fall incidence during the 8-year period in all subjects and non-fallers in 1993 (multiple logistic regression)

	All subjects including fallers and non-fallers in 1993 (997 subjects)		Non-fallers in (865 subjects)	
	Odds ratio	<i>P</i>	Odds ratio	<i>P</i>
<b>Model 1</b>				
In the 8-year period 1993–2001	0.44	0.01	0.44	0.02
Participated in exercise class	1.0		1.0	
No participation in exercise class at all				
<b>Model 2</b>				
Participated in exercise class only in the 3-year period 1993–1995	1.46	ns	1.95	ns
Participated in both the 3-year period 1993–1995 and the period 1996–2001	0.20	0.007	0.19	0.008
Participated only in the 5-year period 1996–2001	0.66	ns	0.59	ns
No participation in exercise class at all	1.0		1.0	

Corrected with the confounding factors such as sex, age, ADL, depression scale and presence/absence of taking drugs in two models.

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